

XVIII. *On the Cynips Caricæ of Hasselquist and other Fig-Insects allied thereto; with description of a new species from Australia.* By Sir SIDNEY SAUNDERS, C.M.G.

[Read September 5th, 1883.]

PLATE XVIII.

IN the 'Proceedings' of this Society (1881, pp. xli—xlv) a discussion is recorded respecting the Fig-Insects collected by Hasselquist in the Levant about the middle of last century, as described in his 'Iter Palæstinum,' edited posthumously by Linnæus in 1757. One of his species, the *Cynips Caricæ*, could never have been seen by Linnæus, who, misled by the equivocal description thereof, subsequently united this species with Hasselquist's *C. Ficus* under the conjoint denomination of *C. Psenes*; the two being essentially distinct in many respects, though found in the same fig; the former (*inter alia*) having a very long ovipositor—described as "*corpore duplo longior*"—and the latter a very *short* one, as exemplified by his specimens still extant in the Linnean collection, the comparative length of which organ had been omitted in the original diagnosis. In fact these two insects must be referred to different families, as Dr. Paul Meyer has already suggested in his Treatise 'Zur Naturgeschichte der Feigeninsecten,' published in 1882 (p. 583); the first belonging to the parasitic races, and the second being a genuine fig-seed feeder (*Blastophaga*, Grav.)

I have lately received from an intelligent correspondent at Smyrna, Mr. C. D. Van Lennep, Swedish Consul there, whose attention had been directed to the subject, several specimens, now exhibited, apparently coinciding with this long-lost *Cynips Caricæ*. They were found, like those of Hasselquist, in the wild Caprificus figs of the autumnal crop which remain on the tree throughout the winter, their insect occupants hibernating therein in the larval state and being matured in the early spring. But Mr. Van Lennep, who has been unremitting in his researches to this effect, has also

obtained the same species in July from the second crop of these figs, which attain maturity at that period; and has forwarded a mass of their abdomens (10 or 12) with the ovipositors attached, found conglomerated together on one occasion inside a fig, serving to display the respective parts of the peculiar oviduct, as now exhibited. He has not, however, succeeded in finding the *C. Ficus* of Hasselquist, described as "*Corpus totum rufum*"; all the *Blastophagæ* met with in these figs being *nigro-æneous* in the females, like the *B. grossorum* of Gravenhorst. The apterous males have also abounded, but no specimens have been found which could be ascribed to the other sex of *C. Caricæ*, though many of the figs themselves have been transmitted at various periods.

Although the *C. Caricæ* had been confounded with the *C. Ficus* since Linnæus' time, yet in Dr. Paul Meyer's elaborate Treatise aforesaid the figure of an insect, apparently identical with these Smyrna specimens, though not described by him, is given under the name of *Ichneumon ficarius* of Cavolini (1782), together with that of its reputed male, a subapterous species closely resembling the *Sycoscaptella? 4-setosa* from Ceylon, recently figured and described by Professor Westwood in our 'Transactions' (1883, p. 43; Plate X., fig. 76). These Smyrna specimens, no less than the female which has been attributed by Dr. Thwaites to the Ceylon subapterous species (as more recently reverted to by Prof. Westwood), structurally coincide with the female *Idarnes transiens*, Wlk. (*Idarnella*, Westw.) which has a winged male corresponding with its winged partner *mutatis mutandis*; both figured and described by Professor Westwood (*loc. cit.*, Plate VI., fig. 36, male; fig. 37, female; with details, figs. 38—42). Thus we are led to infer that, however closely these several species are assimilated in the one sex, a paradoxical divergence occurs among them in the other, not only as regards alary characters, but also in general structural disparity.\*

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\* I have just received from Gallipoli, in Italy, a female specimen of the *Ichneumon ficarius* of Cavolini, which differs from the Smyrna specimens in its far less gibbous, more attenuated and elongate thorax and abdomen, seen laterally; and also one of its subapterous partners (according to Cavolini) apparently coinciding with the aforesaid *Sycoscaptella? 4-setosa*, Westw., from Ceylon. Both were obtained alive in the early part of October from the third crop of the Caprificus figs—the so-called "*Mammoni*" of the Italians—the "*Fornites*" of Tournefort. Oct. 13th.

Hasselquist's description of *Cynips Caricæ* is lamentably deficient in many respects; while that of Cavolini's *Ichneumon ficarius* is contained in a memoir not readily accessible ('Opuscoli scelti sulle scienze e sulle arti,' vol. v., Milano, 1782), and is only casually mentioned by Dr. P. Meyer (pp. 564, 580, 583), whose figures, however, supply various supplementary details. A full diagnosis of these Smyrna specimens seems therefore essential; to which is appended that of a new species of *Idarnella* from Australia, whereof several examples have been found in the figs of *Ficus macrophylla*—all females with the characteristic ovipositor;—a species of *Sycoscaptella*? Westw., with very elongate tarsal setæ, being also met with in these figs.

*Cynips Caricæ*, Hasselq.

(*IDARNELLA*, Westw.)

(Ex individuis nuper in ficibus Smirniensibus declaratis descripta).

*Fœmina.* *Caput* parvum, subrotundatum. *Mandibulæ* rectæ, basi latæ, apice bidentatæ, dentes parum curvati. *Oculi* magni, ovales. *Ocelli* tres, capitis basin versus in triangulo dispositi. *Palpi* parvi. *Antennæ* geniculatæ, thoracis fere longitudinem æquantes; scapo elongato, subrecto, basi constricto apice truncato; articulo 2do clavato, curvato, præcedentis dimidio fere brevior, basi tenui; 3tio 4to 5to minimis, transversis, latitudine sensim crescentibus; sequentibus quinque scudiformibus, longitudine latitudinem vix excedentibus, basi subrotundatis, apice truncatis; reliquis tribus clavam fusi-formem constituentibus. *Thorax* gibbus, ovalis. *Pedes* femoribus parum inflatis; tibiis subrectis, apice truncatis, angulo interno calcaratis, unguibus majusculis. *Pedes antici* breviores, tarsis parvis; *posteriores* quatuor elongati, tarsis longissimis. *Alæ anticæ* pellucidæ, nitidæ, disco setis parvulis instructæ, postice circiterque apicem fimbriatæ; vena postcostali apicem versus in-spissata, usque costam excurva, ulna (Wlk.) radioque setis elongatis in serie dispositis; vena cubitali illo brevior in disco deflexa, parum excurva, tenui, vix clavata. *Alæ posticæ* aveniæ, sicut in anticis fimbriatæ. *Abdomen* dimidio basali lanceolato, thorace parum longiore, segmentis sex; dimidio apicali elongato, constricto, segmenta dua constituenta, quorum primum tubiforme,

corneum, curvatum, apice sensim tenuius, truncatum, subtus anguste canaliculatum; extimum coriaceum penultimi trientis vel quadrantis fere longitudine, tubum infra disjunctum apice attenuatum simulans, utrinque puncto spiraculiformi processuque styliformi postice subtus porrecto instructum, quo tubo oviductus valvulæ basi obtectæ, subter apicem cum terebra hæ semel emergentes vel ex eodem per aditum inferne evadentes. Oviductus (terebra *sc.*) corpore fere duplo longior, valvulis ejusdem apicem versus sensim incrassatis, singulæ setis elongatis duplici serie munitæ; terebra ipsa capillaris, apice parum falcata, e valvula ventrali ad basin segmenti quinti abdominis emissa.

*Idarnella Caricæ* capite, thorace, pedibusque flavis, tarsis articulo extimo fuscato; oculis nigris; ocellis flavis; antennis basi flavis annulis inclusis, flagello fusco; alarum venis pallidis; abdomine flavo, fascia longitudinali dorsali a segmento 3tio usque ad apicem producta, segmentorum basi utrinque plus minusve transverse dilatata; segmento extimo fusco; oviductus valvulis nigris, terebra aurea, apice nigra. Long. corp. 4—4½ mm.; exp. alar. 4 mm.

*Hab.* Circa Smirnam, in *Ficus Caricæ* silvestris forma androgyna dictæ grossis (C. D. Van Lenep). In Mus. nostro.

The structure of the antennæ and wing-veins, as well as that of the abdomen and ovipositor, is precisely identical with the corresponding parts in *Idarnes transiens*, Wlk. (*Idarnella*, Westw.); the tubiform segment, hitherto regarded as appertaining to the oviduct, being followed by an overlapping segment about one-third, or one-fourth, of the length of the former, open along its under side and covering the base of the sheaths, which, together with the terebra, usually emerge below its obliquely-tapering apex, though these are occasionally deflexed through the channel beneath, thus leaving the greater portion of this covering segment extending beyond. These sheaths, closely approximated at their acuminate base, and articulating within the overlapping segment at about one-third of its length, are there connected with the nerves which govern their action, traversing the whole length of the elongate antecedent segment, and further traceable therefrom, in transparent specimens, through the ventral segments up to the base of the

terebra itself. This organ, affixed to a chitinous plate within the ventral region of the 2nd abdominal segment, effects its exit from within the ventral valve of the 5th, and enters the narrow channel that underlies the elongate tubiform segment, leading to the sheaths and their overlapping segment beyond; but, when separated from these sheaths, it may be readily released from below both retaining segments alike, as far as the ventral valve. This is acutely pointed at its corneous projecting apex, thus coinciding with Hasselquist's definition of "*Aculeus alius abdomen terminans*," &c.\*: as in Prof. Westwood's description of this part in the *Cynipidæ* (Mod. Classif., &c., vol. ii., p. 127), "the venter being terminated by a pointed piece having a canal running along its middle, which is also produced considerably beyond its front margin in the shape of a *spine*; this is the terminal ventral segment of the abdomen." The analogy is sufficiently obvious, although the figure here referred to belongs to a different family.

In the elaborate descriptions and figures of various ovipositors in the several allied families, exemplified in the same assiduous work, "as typically represented" in *Pimpla instigator* (*loc. cit.*, p. 139; fig. 75, 8—13), the abdomen of the female exhibits "eight dorsal arcs, the eighth furnished at the tip with two minute styles. On the under side of the abdomen there only exist seven ventral arcs, from the last of which arises on each side a corneous elongated plate, which is the basal portion of the outer sheaths of the ovipositor; the apical portion of these sheaths varies greatly in length in different species, but the articulation always takes place near the extremity of the body." Thus the position of these sheaths in *Idarnella*, and their articulation towards the base of the overlapping segment, serve to indicate this, together with the elongate antecedent segment, as integral parts of the abdomen, the more especially as, exclusive of such prolongation, its dorsal arcs would be reduced to six; the ventral arcs being continuous beyond

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\* Hasselquist's full description is as follows:—"CYNIPS CARICÆ. Partes omnes ut in antecedente (*C. Ficus*!). Abdomen oblongum, tenuius quam in antecedente, utrinque parum acuminatum, a thorace distinctissimum. Spatium inter thoracem et abdomen angustissimum, longius. Aculeus caudæ unicus, corpore duplo longior, capellaris, versus caudam subtilis carinatus, crassior, parumque pilosus, reliqua parte tenuis, glaber, æqualis. Aculeus alius abdomen terminans, minimus, crassiusculus, subrigidus." (*Iter*, p. 425).

the base of the projecting fifth. Moreover, in assigning these constricted segments to the *ovipositor*, the super-addition of the overlapping flap, covering the base of the sheaths but not attached thereto, would seem wholly inexplicable; while the presence of two lateral spiracles towards its apex, together with the usual apical styles and the subjacent acuminate process porrected beyond (ventral?)—as shown in Plate XVIII., figures 1 *d, f, g, h*—constitute additional links in the chain of evidence identifying this with the terminal abdominal segment.

In a posthumous paper by Walker on "Insects destructive to the Fig in India," which appeared in the 'Entomologist' (vol. viii., p. 17; Jan., 1875), he describes a nearly-allied genus (*Polanisa*) as having the "*abdomen* more than twice the length of the thorax, tapering to nearly half its length, compressed and aculeiform from thence to its tip: oviduct longer than the body, emerging from the base of the abdomen; *sheaths* proceeding from the *apex of the abdomen*, slightly incrassated." He subjoins that "the form of the abdomen indicates that in the act of oviposition the *apical half of it* is inserted, as well as the sheaths of the ovipositor." "One specimen" (no longer traceable) is stated to have been obtained—from what source, however, or from what species of fig, or in what part of India, he does not mention;—but the terminal segments, which in *Idarnes transiens* he ascribed to the *oviduct*, are here assigned to the *abdomen*. In fact the elongate tubiform segment possesses *no duct* specially available for oviposition, the terebra being subsequently received from below and virtually independent thereof; the former apparently analogous to Burmeister's "*vagina tubiformis*," defined by him as "a mere continuation of the abdomen," and terminating in proximity to the bipartite sheath or valves of the oviduct (his "*vagina bivalvis*"), "into which," as he says, "the *vagina tubiformis* opens"; supplemented by the "valves corresponding with the last abdominal segment," which "appear as the cover both above and below at the base of the *vagina bivalvis* itself" ('Manual,' Shuckard's Trans., p. 194).

The following antipodean species of this genus, much smaller than the others referred to, entirely corresponds therewith in characteristic details:—

*Idarnella aterrima*, n. s.

*Fœmina.* Caput, antennæ, thorax, femora, tibiæ, abdominis dorsum, valvulæque oviductus, penitus nigri; ocelli diaphani; tarsi venterque pallidi; alarum venæ flavescens, vena deflexa cubitali clavata, parum ex-curva, apice 4-pustulata; terebra rufo-picea. Long. corp.  $2\frac{1}{4}$  mm.; exp. alar.  $2\frac{1}{4}$  mm.

*Hab.* Australasiæ, prope Sydney, in *Ficus macrophyllæ* grossis sat frequens; nonnullæ dimidio fere minores. In Mus. nostro.

With regard to the Caprificus figs adverted to at p. 383, Count Solms-Laubach, in his erudite Treatise on the origin, domestication, and culture of the common fig-tree, *Ficus Carica*, L. ("Die Herkunft, Domestication und Verbreitung der gewöhnlichen Feigenbaums," Göttingen, 1882), observes, that from ancient times two different races of fig-trees were clearly defined, which have remained unchanged to the present day: the one comprising the countless varieties of edible figs cultivated everywhere; the other bearing inedible fruit which remains milky and hard up to the period of maturity, when it partially softens without acquiring saccharine juices, until it finally becomes shrivelled and desiccated. This tree is only cultivated in certain countries for special purposes, being mostly allowed to shoot up spontaneously or grow wild: the Greeks called it ἐπίειος (or ἐπίωος); the Latins, "Caprificus." Hence the term "*caprification*"—an operation still in vogue in many regions while repudiated in others—on the efficacy of which the Count, after diligent investigation during a long sojourn at Naples, where this doctrine is generally accepted, pronounces as follows:—"Caprification is an operation traditionally practised in the same way from generation to generation, which, necessary in bygone ages, is now scarcely any more useful ('jetzt kaum mehr nützliche'), the scientific importance of which, as a means of evincing the changes our cultivated plants have experienced in the lapse of time, cannot be too highly estimated" (*op. cit.*, p. 44).

But the question of fact remains unsolved as regards the possibility of any benefit ever accruing from this system of hanging the Caprificus figs tenanted by the *Blastophagæ* upon the domestic fig-trees at a certain season, whether for the conveyance of pollen, or for

promoting the distension, maintenance, or maturity of the crop; the figs subjected to this process affording no proof of the actual presence of the *Blastophagæ* within the same: "or a single *Caprificus*-tree is planted in the fig-gardens, the passing of the insects to other trees being left to chance" (*Ibid.*, p. 24).

Count Solms gives various interesting details from different writers respecting the habits of these insects,—of their forcible entrance into the wild figs by squeezing themselves between the scales of the "*Ostiolum*," where he had himself frequently noticed a quantity of their disrupted wings ("ganze Buschchen solcher abgestreifter Flügel," p. 20) left there in the persistent efforts they make to pass this barrier,—of their subsequent demeanour and oviposition, *their bodies being long recognisable within the cavity of the fig*,—and of the eventual egress of the succeeding brood, still, as he states, from between the scales of the *Ostiolum*. At Smyrna, however, these scales usually disappear ere then, leaving a free passage instead, which the fig-growers are accustomed to plug with a seed-pod of the asphodel, when transferring such infested figs from place to place for the purpose of caprification, an operation they deem so essential that, if these figs fail, as sometimes occurs, they import them from other far distant localities. He also narrates, that when the female *Blastophaga* effects her egress she "adjusts her wings, places them together, raises them perpendicularly, suns and dries herself, and cleanses her hairy (?) body with her feet *to free it from the adhering pollen*, wherewith she had become so begrimed in creeping through the crowning stamens that she seemed powdered all over"—thus effectually disposing of the *pollen* argument!

But we do not learn that the Count noticed any of these *disrupted wings* adhering in like manner to the scales of the *domestic figs*; or that he had discovered any such *bodies* in these, which in the other figs are *long recognisable within the cavity!* On the contrary, in adverting to an assertion of Godeheu de Riville ('*Mémoire sur la Caprification*,' Paris, 1755) that this writer "had also found them in ripe figs," the Count significantly adds—*which I did not succeed in doing* ("was mir nicht gelungen ist")! He could not have failed to detect them in Naples, where caprification is revered as a doctrine of faith, had they existed in



the latter; so that in both instances, as in that of the pollen also, there is a lack of evidence which it would be difficult to reconcile with any reputed virtues attributed to the caprification process.

Nevertheless a theory has been advanced by some Italian writers, whereon the Count enters into elaborate explanations of his own (p. 36), to account for the non-existence of any brood of these insects in the domestic figs, namely, that from some strange anomaly their ova are not suitably deposited, and consequently remain unproductive: whereon Dr. Paul Meyer, in his valuable Life-History of Fig-Insects, already referred to, after summarizing the Count's remarks on this head, illustrated by a copy of his Diagram (p. 560), observes—the reasons which render oviposition impossible here are not known! The explanation, however, would seem to be, that this hypothesis being necessarily dependent upon experimental essays made with figs laid open for the purpose of artificially introducing the *Blastophagæ* (which are otherwise not to be found therein), the rapid effects of partial desiccation ensuing on such occasions preclude the egg from attaining its proper position, being sometimes met with even reversed, with the pedicel pressed in forwards, as described in these experiments.

Others, however—among whom the Count cites several writers, including Olivier—have denounced this operation as an inveterate prejudice; and Gasparrini, of Naples, who had profoundly studied the subject, comes to the same “conclusion” (as quoted by the Count, p. 27), namely, “Abbiamo veduto con esperimenti che l'insetto non accelera la maturazione, ne fa allegare i frutti—e che però la caprificazione torna del tutto inutile per l'allegamento e la maturazione dei frutti; anzi dovrebb'essere abolita nella nostra agricoltura.”

As regards the trees themselves, Gasparrini has shown that the *Caprificus* and its domestic associates appertain alike to the *F. Carica*, L.; for, after rearing a number of seedlings from three varieties of the domestic fig-tree, a few of which bore fruit in 1852, some corresponding with the latter and others with the former, he records his results as follows:—“Res itaque ad pristinum revocanda nam *Caprificus* et *Ficus* uti ex experimenta liquet sunt individui ejusdem speciei ex qua tot tantæque varietates et subvarietates promanant” (Solms, p. 19).

EXPLANATION OF PLATE XVIII.

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- FIG. 1. *Idarnella Caricæ*, female, magnified.
- 1 *a.* Mandibles of ditto.
  - 1 *b.* Antenna of ditto.
  - 1 *c.* Abdomen and ovipositor of ditto, seen laterally.
  - 1 *d.* Terminal segment apart.
  - 1 *e.* Bipartite sheath of ovipositor of ditto.
  - 1 *f.* Terminal segment, as seen *in situ*.
  - 1 *g.* Ditto, in another position.
  - 1 *h.* Ditto, seen transparently.
  - 2 *a.* Antenna of *Idarnella aterrima*, female.
  - 2 *b.* Abdomen and ovipositor of ditto, seen transparently.
  - 2 *c.* Anterior portion of fore wing of ditto.